Participatory design in secondary education: is it a good idea? Students' and teachers' opinions on its desirability and feasibility

Short title: PARTICIPATORY DESIGN IN EDUCATION

This is a pre-print of the article that was published as

Könings, K. D., van Zundert, M. J. Brand-Gruwel, S. & van Merriënboer, J. J. G. (2007). Participatory design in secondary education: Its desirability and feasibility according to teachers and students. *Educational Studies, 33*, 445-465.

http://www.tandf.co.uk/journals/CARFAX/03055698.html

Participatory design in secondary education: Is it a good idea?

Students' and teachers' opinions on its desirability and feasibility

Karen D. Könings, Marjo J. van Zundert,

Saskia Brand-Gruwel, and Jeroen J. G. van Merriënboer

Open University of the Netherlands

This research was supported by the Netherlands Organisation for Scientific Research (NWO) under project number 411-01-052.

Correspondence concerning this article should be addressed to Karen Könings, Open University of the Netherlands, Educational Technology Expertise Center, PO Box 2960, 6401 DL Heerlen, The Netherlands. E-mail: karen.konings@ou.nl

Abstract

Research has shown the importance of students' perceptions of a learning environment and the existence of discrepancies between students' and teachers' perceptions. Participatory design could be a helpful strategy to reduce such discrepancies and eventually improve the design of learning environment, as it has proven to be effective to optimise design in other domains. The current study investigated the desirability and feasibility of possible use of participatory design in education. Students and teachers in secondary education were interviewed about their opinions on the idea of participatory design of a learning environment. Both students and teachers displayed predominantly positive opinions towards possibly engaging in participatory design, supporting its desirability and feasibility. Practical suggestions for implementation are included.

Keywords: Secondary education; Participatory design; Perceptions of a learning environment; Students; Teachers

Participatory design in secondary education: Is it a good idea?

Students' and teachers' opinions on its desirability and feasibility

In education it is common practice for educational designers and teachers to create learning environments that are expected to be as beneficial as possible for students, without any interference of its users (i.e., students). In fact, students are often seen as consumers who do not have any influence on the design of the learning environment and teaching practices (Cook-Sather, 2001). This is remarkable and seems rather problematic regarding the fact that especially students' perceptions of a learning environment determine their learning behaviour (Elen & Lowyck, 1999; Elen, Lowyck, & Bamps, 1998; Entwistle, 1991). Moreover, striking differences exist between students' and teachers' perceptions of a learning environment (Doppelt, 2004; Könings, Brand-Gruwel, & van Merriënboer, 2005b; Winne & Marx, 1982). Participatory design could help in taking into account students' perceptions of a learning environment, and offer a remedy for existing discrepancies between the perceptions of the students and the teachers. The current study explores the possibility of future implementation of participatory design in an educational context. This is done by investigating both teachers' and students' opinions on the feasibility and desirability of discussing and collaboratively designing education.

The perceptions of students are of central importance for effective learning. Foremost, their perceptions of the learning environment rather than the characteristics of the learning environment per se do appear to determine the effectiveness of their learning (Elen & Lowyck, 1999; Elen, Lowyck, & Bamps, 1998; Entwistle, 1991). Although a learning environment may have high potential to reach certain educational goals, its effectiveness may remain uncertain because this is greatly influenced by

students' perceptions of this environment. The perceptions determine subsequent learning and study behaviour, which affect learning outcomes, and thus determine the effectiveness of the learning environment (ibid). Therefore, it is very important to give students' perceptions a clear position in the design process of a learning environment (see also Könings, Brand-Gruwel, & van Merriënboer, 2005a).

The need to pay more attention to the students' perspective on educational design is further strengthened by research showing that striking differences do exist between students' and teachers' perceptions. In 1982, Winne and Marx already described the differences between teachers' instructional stimuli, intended to evoke particular cognitive processes in students, and students' perceptions of these stimuli. Discrepancies between teachers and students are also shown in a study on perceptions of the impact of several aspects of a learning environment on learning outcomes (Doppelt, 2004). In this study, students considered, for instance, classroom discussions to be the second most important learning environment characteristic to influence learning outcomes, while teachers placed this only on rank six of most important characteristics. A recent study of Könings, Brand-Gruwel, and Van Merriënboer (2005b) has also shown significant differences between students' and teachers' perceptions of a learning environment in Dutch secondary education. It has shown students to have a more negative view on the learning environment than teachers, who were more positive. Students, for example, considered learning goals as less clear and rated subject matter as less interesting than teachers.

If users of an intervention perceive it differently than the designers who developed the intervention do, this is likely to result in a decline of the effectiveness of the intervention (Bartholomew et al., 2001). In an educational context, this would mean that if students perceive particular aspects of the learning environment

differently than teachers, the effectiveness of the learning environment might be reduced. As research has shown the existence of such discrepancies between students' and teachers' perceptions, there is a clear need to invest effort for finding an effective method for reducing these discrepancies. A convincing solution or a useful method for reducing existing discrepancies has not yet been found. There are two lines of research that, at first sight, might contribute to the reduction of discrepancies and the consideration of students' perceptions: (1) matching studies, and (2) student evaluations as feedback for teachers.

First, in matching studies it is the goal to improve learning effectiveness by matching instruction to the individual characteristics and the needs of the student. As shown by Cunningham (1975), student-teacher pairing can for instance have positive effects on students' task orientation. Limited effects, however, are found in a study using students' cognitive style for matching (Packer & Bain, 1978). Interestingly, Trout and Crawley (1985) found a non-monotonic relation between the matching variables (i.e., need level, cognitive style, and locus of control) and outcome variables (i.e., attitude and achievement outcomes). "As compatibility became more complete student attitudes and achievement improved to a point. After some intermediate degree of compatibility was reached, further compatibility between learning needs and instruction only resulted in a decline in attitude and achievement" (Trout & Crawley, 1985, p. 415). More recently, Saracho (2003) concluded that matching practices are complex and experimental studies yielded conflicting results that restrict educationalists from generalisation. She, however, stressed the persisting need to adapt instruction to students' needs.

A second line of research concentrates on informing teachers about students' evaluations of the learning environment (as a form of feedback). Research has shown

that the agreement between teachers' self-perceptions of their own teaching effectiveness and students' evaluation of actual teaching effectiveness is rather low, in absence of formal and systematic feedback from students (Roche & Marsh, 2000). After receiving student feedback, teachers' self-perceptions are correlated higher with student ratings, showing that teachers adjust their self-perceptions in response to feedback. However, delivering teachers negative feedback without providing help to improve teaching practices might be ineffective (ibid). Pambookian (1976) stressed the importance of cognitive dissonance theory (Festinger, 1957) in this context. Teachers who are confronted with discrepancies between self-perceptions and students' perceptions may reduce these discrepancies (i.e., cognitive dissonance) by rejecting the feedback as invaluable, or by changing own conceptions instead of changing instruction. In that respect, student evaluation of education is not a promising strategy for accounting more intensively for students' perceptions of a learning environment, and for reducing discrepancies between students' and teachers' perceptions.

Both matching approaches and the use of student evaluations have severe limitations. An alternative tool or strategy is needed to take into account students' perceptions of a learning environment and to bridge the gap between teachers' and students' perceptions. Participatory design can, possibly, offer a valuable approach.

Participatory design aims at active participation of users in the design process and in decisions that will affect themselves (Kensing & Blomberg, 1998; Mankin, 1997). In many areas different from education, it is common practice to involve potential users of products and systems in their design, in order to produce a more effective and usable product or system. For example, in the field of cognitive ergonomics and health promotion the benefits of user participation are already

demonstrated (Bartholomew, Parcel, Kok, & Gottlieb, 2001; Meister & Enderwick, 2002). A participatory (re)design process constitutes an analysis of needs and possibilities according to designers and the users, a collective generation of ideas for change, project management, and planning for implementation (Kensing, Simonsen, & Bødker, 1998). Designers need to gain more insight in the actual use of a system and users need to be informed by designers about possibly alternative designs. Relations should not be hierarchical or bureaucratic, but democratic, in order to spread responsibility for the process and the product, and, eventually, make successful participation possible (Mumford, 1997; Schweitz & Granata, 1997).

There are some claims in educational literature that support the investigation of new strategies to have students involved in the design process. Markopoulos and Bekker (2003) stated that educational design should be driven by knowledge of the students, and that they should not only be involved as users, testers and informants but as real design partners. Students are shrewd observers and possess valuable knowledge about learning and teaching (Lincoln, 1995). Schools and teachers should hear students' voices, which requires a major shift in relations and in ways of thinking and, also, requires to trust students having relevant knowledge (Cook-Sather, 2002). Besides, students should be stimulated to think metacognitively and critically about their own perceptions of a learning environment, to be more engaged, and to feel more responsible for their education (ibid). Conversation between teachers and students is crucial for initiating changes in education. By conversation it is possible to create coherence in thinking (Jenlink & Carr, 1996). In a dialogue conversation, sharing of meaning is brought about by examination of individual opinions and sharing them with others. Participants become aware of the diversity of opinions and

start creating new assumptions and more common opinions, which, eventually, lead to collective thoughts about educational design and possible changes in it.

Thus, educational literature offers some claims that participatory design might be a helpful strategy to deal with students' and teachers' differing perceptions of the effective characteristics of a learning environment and to reduce these discrepancies in perceptions. However, empirical findings supporting this claim are yet missing. The main goal of the current study is to find out how teachers and students think about possible use of participatory design in educational context. By investigating their opinions on the idea of participatory design *before* actually implementing it, we hope to improve the chance on successful future implementation of it. While the background of the current study is situated in discrepancies between students' and teachers' perceptions of a learning environment, the current study will, first of all, investigate the causes students and teachers give for these discrepancies. Additionally, students' and teachers' opinions will be examined on the desirability and feasibility of potential use of participatory design in education, as a strategy for taking students' perceptions into account and as a possible aid to bridge the gap between students' and teachers' perceptions. The study will investigate whether and in which ways teachers and students would be willing to engage in the participatory (re)design of their learning environment.

Related to these research questions, it is important to acknowledge that there is a great deal of variability among perceptions that different students have of the same learning environment (see, e.g., Könings, Brand-Gruwel, & Van Merriënboer, 2005c). The same holds for teachers. The study mentioned earlier has shown that, on the one hand, student perceptions are generally lower (i.e. more negative) than teacher perceptions but, on the other hand, both students' perceptions and teachers'

perceptions greatly vary between relatively low and relatively high. Looking at discrepancies between students' and teachers' perceptions, this implies that the largest discrepancy exists between low-perception students and high-perception teachers. For them the greatest need exists for reducing discrepancies, which can possibly be achieved by means of participatory design. However, it is important to know whether a possible implementation of participatory design has to be adapted to these different types of students and teachers. Therefore, differences in opinions on the idea of participatory design between low and high-perception participants will also be investigated in the current study.

In sum, the current study will answer the following research questions:

1. Which causes do students and teachers themselves suggest for the differences in their perceptions of the learning environment?
2. What are students' and teachers' opinions on possible use of participatory design in education, that is, involving students in (re)designing the learning environment in collaboration with teachers?
3. What preferences do students and teachers have about the way participatory design can implemented in educational praxis?
4. Do opinions on participatory design differ between students who have high and low perceptions of the learning environment, as well as between high and low-perception teachers?

Method

Participants

The study was conducted at senior general secondary education and pre-university education departments of two schools for secondary education in the Netherlands. In total, 24 tenth-grade students and 12 teachers teaching tenth-graders

were interviewed. Students were sampled on basis of data of a study by Könings, Brand-Gruwel and van Merriënboer (2005d). In this questionnaire study, students' perceptions about mathematics education and Dutch language education were measured with a 5-point Likert scale. The sample consisted of 12 students who had relative high (i.e., positive) perceptions of the learning environment for mathematics education or for Dutch language education (called high-perception students; $M = 4.41$; $SD = .34$). Another 12 students were selected because they had relative low (i.e., negative) perceptions about the learning environment for mathematics education or for Dutch language education (called low-perception students; $M = 2.60$; $SD = .56$). Half of the participants followed senior general education and half of them attended pre-university education. Both genders were equally represented. The mean age of the students was 16 ½ years ($SD = .7$).

Teachers were sampled on basis of their previously measured perceptions of the learning environment as well (Könings, Brand-Gruwel, & van Merriënboer, in press). The sample consisted of six teachers who had relative high perceptions of the learning environment as measured with a 5-point Likert scale ($M = 4.63$; $SD = .35$), and three teachers who had relative low perceptions of the learning environment ($M = 3.83$; $SD = .21$). The teachers (3 female, 9 male, with a mean age of 47 years ($SD = 9$) were teaching language courses ($N = 4$), science courses ($N = 4$), and humanities, such as history and geography ($N = 4$). On average, they had 23 years of teaching experience ($SD = 10$). Students and teachers were sampled, separately, on basis of data from previous research. Teachers were not necessarily teaching the students in this sample.

Materials

Student Interview Scheme. Student interviews contained 12 main questions (see Table 1). Each interview started with general questions concerning opinions on causes of the striking differences between students' and teachers' perceptions of learning environments. Then, students were asked how they would feel about collaboration with teachers in order to redesign their learning environment. Also, suggestions about how such collaboration could take place were inquired. Students were asked whether they would especially prefer implementing participatory design in specific (types of) courses and whether they think participatory design would be feasible and desirable for either mathematics or Dutch language education, in accordance with the questionnaire they filled out during the course-specific previous study (Könings, Brand-Gruwel & van Merriënboer, 2005d). For each interview question, additional sub questions were available in case students did not know what to answer or the discussion was not as elaborate as was desired by the experimenter.

Teacher Interview Scheme. Teacher interviews contained 11 questions, identical to the questions from the student interview except for the two course-specific questions, which were not relevant to the teachers and therefore were left out. One additional question was posed to teachers concerning the involvement of low-perception students in participatory design activities. Earlier research (Könings, Brand-Gruwel, & van Merriënboer, 2005c) showed that less motivated students often have low perceptions of a learning environment. Teachers were asked their opinion on the feasibility and desirability of involving these less motivated, low-perception students. For each interview question additional sub questions for making things more explicit and for elaboration were available.

Coding scheme for analysing the interview data. A coding scheme was developed for labelling the data. The typed-out answers to the interviews were

categorised with this coding scheme, which contained 61 labels in total for 13 interview questions (10 identical questions for students and teachers; 2 questions for students only, and 1 question for teachers only). The labels were developed on the basis of a literature study (top-down) as well as on the basis of the data themselves (bottom-up). In several iterations the labels were reformulated and refined until the interrater reliability was acceptable. The interrater reliability of the coding scheme was established by computing Cohen's Kappa for each interview question (see Table 1): Six Kappas were between .90 and 1.00, five Kappas were between .80 and .90, and two Kappas were between .70 and .80. A description of the meaning of each label can be found in the Appendix. For example, when asked if students convey their educational ideas to teachers, one response category (label) included 'opportunity'. A precise description of 'opportunity' is: 'The teacher does not ask students directly about their ideas related to education, or does not provide the opportunity for students to give their opinion'.

Procedure

All participants were individually interviewed by the same experimenter, who did not have a working relation with the participating schools. After emphasizing that all information acquired during the interview would be handled confidentially, it was introduced that results from previous research in which they themselves had participated (conducted in their schools), showed big differences between students' and teachers' perceptions of the current learning environment, and in particular it showed that students generally had more negative perceptions than teachers. After this introduction the interview started, following the interview scheme. The interviews took between 20 and 40 minutes. Each interview was recorded with a tape recorder.

Data Analyses

All interviews were typed out and labelled according to the coding scheme. The experimenter, who interviewed the participants, rated all data form the interviews. For computing Cohen's Kappa, a second experimenter, independently, rated the answers of five participants for each interview question. In order to answer the research questions, the frequency of occurrence of each label was counted, both in student and teacher responses. Chi-square tests were computed on response frequencies of students and teachers, in order to test whether students and teachers significantly differed with regard to their answers to the interview questions. For investigating possible differences in responses between low- and high-perception participants, chi-square tests were computed on response frequencies, for students and teachers separately. In addition to significant results ($p < .05$), also trends with $p < .10$ will be discussed. For questions 11a, 11b, and 12, no chi-squares were computed, as these questions are not relevant to either students or teachers. For computing chi-squares the Fisher's Exact Test was used. Because of the small number of participants, the expected cell frequency was sometimes less than five, indicating a reduced power of the tests. The Fisher's Exact Test accounts for this.

Results

Table 2 presents the response percentages per label (separately for students and teachers) and the results of chi-square tests comparing students' and teachers' response frequencies. It should be noted that the percentages do not necessarily sum up to 100 %, as it is possible that respondents' answers fitted more than one label per question.

Causes for the Differences Between Students' and Teachers' Perceptions

The first research question involved the causes that students and teachers suggest for the fact that students' perceptions of the learning environment are in

general more negative than teachers' perceptions. Results of interview question 1 (see Table 2) showed that students stated that too much workload is imposed on them (58.3 %), that school is obligatory, they do not have choices and must do as they are told (25.0 %), and that students simply do not like going to school (16.7 %). A quarter of the teachers mentioned the workload imposed on students, but the majority of the teachers provided answers in the category of other explanations (66.7 %), like the differences in goals of students and teachers and the trend of school becoming less important for students due to an increase of after-school activities. Teachers more often provided other explanations for differences between students' and teachers' perceptions than students did ($\chi^2 = 9.00$; $p = .01$). More students than teachers regarded excessive workload to be an important reason for the more negative perceptions of students ($\chi^2 = 3.57$; $p = .08$).

Students' and Teachers' Opinions on Participatory Design

The second research question investigates students' and teachers' perceptions of the current state of discussion about educational praxis and their opinions on the idea of possible use of participatory design, which was explored in interview question 2 up to 6. Looking at the results of interview question 2 (see Table 2), they show that not a single student agreed that students convey their ideas about education to teachers. Students give different reasons for this negative answer: The expectation that telling their ideas to teachers has no use because teachers do not use this information (29.2 %); fear of conflicts with teachers when discussing about education and not daring to say anything (assertiveness, 16.7 %), and teachers not giving the opportunity to students to convey their ideas (16.7 %). Half of the teachers, however, stated that students do convey their ideas about education to them, which is a huge difference to students' responses ($\chi^2 = 14.40$; $p < .01$). A negative answer because of

negative expectations was provided by 29.2 % of the students but none of the teachers ($\chi^2 = 4.35$; $p = .07$).

The results of interview question 3 showed that a large number of students (41.7 %) replied that in their school no initiatives exist for discussing the educational design among students and teachers. This is remarkable, because in fact a discussion forum did exist in both schools. Some students (16.7 %) stated that a kind of discussion group exists, but that this group does not operate in an effective way (i.e., no feedback from meetings was returned to teachers or other students). Also, half of the teachers did not confirm the existence of a discussion format (not present, 16.7 %; do not know, 33 %). A quarter of the teachers replied that the existing group does not function effectively.

The results of interview question 4 showed that 58.3 % of the students would appreciate to engage themselves in the participatory design of education, while 20.8 % of them did not think it to be a good idea. Half of the teachers were positive about engaging in participatory design as well. In addition, one quarter stated that participatory design would be possible for some educational topics, but not for other topics. Students never (i.e., significantly less) mentioned the latter answer ($\chi^2 = 6.55$; $p = .03$).

The results of interview question 5 showed that 41.7 % of the students stated that the vast majority of their peer students would be willing to engage in the participatory (re)design of their educational environment. Almost half of the students (45.8 %) thought that some of their peers would be interested but others would not. A quarter of the teachers thought that the majority of their colleagues would be positive, and a third expected that the majority would have a negative opinion. One third of the

teachers figured a fairly equal distribution of proponents and opponents among their colleagues.

In response to interview question 6, half of the students answered to be confident that most of the teachers are willing to cooperate with students. Some students (20.8 %) thought that the distribution of proponents and opponents would be more or less equal. Only part of the teachers (16.7 %) believed that the majority of students want to cooperate with them, while a quarter thought that students would have a negative attitude towards collaboration with teachers. Two-third of the teachers assumed a more or less equal distribution or did not know how willing students would be (both 33.3 %). It seemed that the confidence in the willingness of the other party to involved in participatory design was smaller for teachers than for students ($\chi^2 = 3.74$; $p = .08$).

Preferences for Participatory Design in Practice

The third research question involved acquiring concrete ideas about the ways in which students and teachers want to implement participatory design. Interview questions 7 up to 12 were analysed in order to answer this research question.

In response to interview question 7, 62.5 % percent of the students indicated that pedagogies are a negotiable topic. A quarter of them named the contents of the lessons and somewhat more than one fifth (20.8 %) emphasized planning as a topic of central importance. Most of the teachers too (66.7 %) considered pedagogies as a negotiable topic. One quarter of the teachers agreed on discussing all topics students wish to discuss. There was a tendency that this answer was given more frequent by teachers than by students ($\chi^2 = 3.52$; $p = .098$).

In response to interview question 8, 58.3 % of the students indicated they found in-class discussions as a suitable format for participatory design. Of the

teachers, 41.7 % preferred in-class discussions. However, most of them (75.0 %) would prefer to discuss (re)design with a small group of students. More teachers than students preferred this small-group discussion format ($\chi^2 = 11.80$; $p < .01$).

In response to interview question 9, which addressed how frequent discussions between teachers and students should best take place, 54.2 % of the students showed a preference for once or twice a month. Less teachers (16.7 %) were willing to collaborate that often ($\chi^2 = 4.63$; $p = .04$). Teachers preferred a frequency of one to three times a year (41.7 %) or the preferred situational discussions, only when problems arise or the necessity is felt (25.0 %).

The results of interview question 10 showed that students would like to work with teachers who have an open attitude (62.5 %), or with teachers who are involved with students (20.8 %). Almost 30 % of the students mentioned other desirable personality traits of teachers, for example, wisdom and humour. About 40 % of the teachers felt no preference for cooperating with a specific type of students. One quarter of the teachers explicitly wished to work with motivated students only. The differences between students and teachers concerning an open attitude ($\chi^2 = 12.86$; $p < .01$), no preferences ($\chi^2 = 8.10$; $p = .01$), and preferences for motivated participants ($\chi^2 = 6.55$; $p = .03$) were significant.

Interview question 11a asked teachers whether they thought it would be possible and valuable to involve low-perception students, who are expected to be less motivated as well (Könings, Brand-Gruwel & Van Merriënboer, 2005c). A positive opinion on working with less motivated students was indicated by 41.7 % of all teachers, while half of the teachers was not sure whether involvement of these students would positively contribute to the (re)design process.

Interview question 11b asked students about preferences for courses in which participatory design could best be implemented. One third of the students preferred to apply participatory design to difficult school subjects, while another third did not show any preferences.

Interview question 12, finally, asked students if they thought it would be possible to implement participatory design in either Dutch language lessons or mathematics lessons. About 80 % of the students answered with 'yes'.

Differences Between High-Perception and Low-Perception Participants

The fourth and final research question concerned whether high and low-perception students and high and low-perception teachers differed in their opinions on possible use of participatory design. Only one difference between high and low-perception teachers emerged, namely, for interview question 2. When teachers were asked if students convey their ideas about education to them, only 16.7 % of the low-perception teachers agreed while 83.3 % of the high-perception teachers agreed ($\chi^2 = 5.33$; $p = .08$). No other significant differences between high and low-perception students or high and low-perception teachers were found.

Discussion and Conclusion

The current study explored students' and teachers' opinions on possible use of participatory design in education for reducing the discrepancies between students' and teachers' perceptions of the learning environment, what eventually would improve the quality of the learning environment. The study aimed to examine if and how both students and teachers in secondary education would be willing to engage in participatory (re)design of their learning environment.

The aim of the first research question was gaining insight in causes that students and teachers themselves suggest for the differences between them in

perceptions of the learning environment. Many students address the issue of high-imposed workload as a cause for more negative student perceptions, whereas teachers often provide other reasons such as students having less interest in school. The fact that only a few teachers acknowledge that many students suffer from high pressure provides evidence for the existence of a gap between students' and teachers' perceptions and interpretations of the situation. The need for better communication and more common understanding between students and teachers is underlined.

In order to gain more insight in students' and teachers' opinions on possible use of participatory design (the first part second research question), both the current situation concerning discussion about educational praxis and their preferences with respect to participatory design initiatives are queried. Remarkably, students' and teachers' perceptions of the current situation appear to differ astonishingly. Although half of all teachers claim that students convey their educational ideas to them, not a single student says he/she does. One of the reasons students put forward for not conveying their ideas to teachers is their expectation that teachers will not use this information. Another reason is the lack of opportunities to talk about their ideas about education. The existence of current discussion formats in school is not clear to either students or teachers. This is a rather unexpected outcome, as inquiry of the school policies learned a resonance group of students and teachers to be present in both schools. Hence, these groups may not be completely effective and more action seems to be necessary to reach everyone in the school. A suggestion could be to distribute explicit reports from discussions that take place in the resonance group to all students and teachers.

The second part of research question 2 investigated the desirability and feasibility of future implementation of participatory design. It shows that a majority of

both students and teachers holds positive opinions toward cooperating with one another to improve education in their school. Some of the teachers who favour participatory design are, however, not willing to involve students in all educational topics. In particular, some topics would be less negotiable because these are difficult to change due to governmental restrictions and a mandatory minimal curriculum (e.g. learning contents). The few students and teachers who have a negative opinion state that participatory design would take too much of their spare time, and means longer days in school. To overcome this problem, it would be beneficial if student-teacher negotiations will be scheduled during regular school hours. Additionally, some students who do not favour participatory design claim that teachers are the professionals and they "know what is best". It is true that teachers are professionals who are knowledgeable and experienced in educational issues. However, this does not mean that teachers are omniscient, and could not benefit from feedback and differential views from students. In contrast, one might claim that real professionals should be sensitive for the needs of their target group. This needs to be clarified for both teachers and students. If the sceptical students recognise their ability and necessity to contribute, their appreciation of participatory design might increase. Overall, the predominantly positive opinions of many students and teachers towards possible use of participatory design provide a promising perspective for its implementation in secondary schools.

The third part of research question 2 involved students' and teachers' ideas about the attitudes of other students and teachers toward participatory design. Most students state that a vast majority of peer students would appreciate the idea of collaborating with teachers or that there will be an equal distribution between proponents and opponents of participatory design. Only a few students think that the

majority of their peers would not be willing to engage in participatory design. Among teachers, the supposition of attitudes from colleagues is more or less the same. Furthermore, students' notions and ideas about the willingness of teachers to cooperate with students are fairly positive. However, teachers are less positive about students' willingness: They express doubts on students' enthusiasm to collaborate with teachers. Some teachers state that students are not really interested in educational matters. However, exactly for these students, being more involved in the educational process may raise their interest in it.

The third research question concerned students' and teachers' preferences for the way of implementing participatory design. As for topics, both students and teachers would prefer to discuss pedagogies. They both indicate that discussions between the students and their teacher can be well organised in a class context. However, especially teachers (but students also) prefer discussion groups consisting of a teacher and a small group of students. The idea is that small groups of students are able to represent the opinion of the whole year group, without resulting in messy discussions that get out of hand.

With respect to the desired frequency of participatory design meetings, most students prefer to collaborate with teachers once or twice every month. Many teachers prefer a frequency of one to three times a year. An important objection turned out to be time commitment. Students as well as teachers emphasise that participatory design costs time. Investing even more time in school is not a welcome idea, because students and teachers already have a busy schedule. A solution, already put forward, includes scheduling time for participatory design during regular school hours. Students prefer to implement participatory design especially for difficult subjects and

subjects which are important for them because they prepare for their final examination.

Students prefer to cooperate especially with teachers who are tolerant towards different opinions and who have an open attitude, meaning that they listen to what students have to say. Many teachers express no preferences concerning types of students with whom they want to be involved in participatory design. Teachers were also explicitly asked for their opinions on working with less motivated students, and they are either doubtful or positive towards working with them. The fact that most teachers do not rule out the possibility to work with less-motivated students, provides support for involving a diverse group of students in participatory design activities. Less motivated students often experience the learning environment negatively (Könings, Brand-Gruwel, & Van Merriënboer, 2005c). As perceptions of the learning environment of these low-perception students generally differ most with perceptions of teachers, involving them in participatory design may be interesting and beneficial.

The fourth research question was focused on the identification of differences in opinions on possible use of participatory design between high and low-perception students and between high and low-perception teachers. It seems that high-perception teachers state more often that students convey their educational ideas to them than low-perception teachers. The lack of further differences implies that students' and teachers' opinions on possible use of participatory design as well as preferences concerning the format of implementation do not depend on their (more positive or negative) perceptions of the learning environment. Consequently, it would be unnecessary to specifically adapt the format of participatory design activities to students and/or teachers who have high or low perceptions of the learning environment.

In sum, the results of our study show that – according to students and teachers – participatory design is feasible and desirable initiative in secondary education. The following seven preferences can be deduced out of this study: (1) the discussion topic of pedagogies should be emphasized, because the desire to discuss this is high amongst both students and teachers; (2) cooperation between a teacher and a small group of students, rather than a whole year group, seems desirable; (3) both students and teachers prefer planning discussions with a frequency of about three times a year, whereas part of the students prefer it to be more frequent; (4) students prefer implementing participatory design especially for difficult subjects and courses which are important for them; (5) teachers should try to have an open and tolerant attitude; (6) a group of students participating in the (re)design process must be heterogeneous with regard to motivation, and (7) the format of participatory design activities does not need to be adapted to high- or low-perception students and teachers.

When intending to implement participatory design into practice, it is important to realise that teachers will consider the value of this innovative initiative, before starting to invest in its implementation. Teachers are likely to value innovations highly that match their ideas of what is a practicable (Paulussen, Kok, Schaalma, & Parcel, 1995). Innovations are considered to be practical if they provide clear procedural instruction, and are compatible with prevailing classroom conditions. Furthermore, teachers will consider the costs (i.e., time and invested energy), in relation to the potential return of the implementation of the innovation. If costs are lower than the return, teachers are more willing to implement the innovation than in case the costs are higher than the return. Some potential returns of participatory design could be an increase in students' and teachers' satisfaction with the learning environment, an increasing sense of responsibility and involvement of students in

education, and a stimulating influence on metacognitive learning processes. Providing teachers with profound information about the importance and benefits of participatory design may stimulate the implementation. It would be an advantage if school management promotes and supports teachers in practicing participatory design. In addition, scheduling some time for incorporating participatory design in normal school practice would be favourable.

A limitation of the current study may be its generalisibility, because the data collection was conducted in only two schools for secondary education. However, a comparison between the results of both schools on all 61 labels (using Chi-square tests, separately for students and teachers) only shows two significant differences between the schools. This indicates that the limitation is likely not to be severe. Another potential limitation is the social desirability of the given answers. Although the use of interviews was adequate for this qualitative, explorative study, participants might have been influenced by the experimental situation and the presence of the interviewer, possibly resulting in social desirable answers to the interview questions. Additionally, the respondents were required to answer more or less immediately after listening to the question. They did not have much time to think about the answer thoroughly, which might lead to incomplete or slightly inaccurate accounts.

In order to be able to provide a more complete and universal picture of the desirability and feasibility of participatory design in educational settings, future research in other schools and educational sectors will be beneficial, as well as including a larger number of participants. The use of anonymous questionnaires rather than personal interviews could also be considered, in order to decrease the participants' potential tendency to provide social desirable answers. More innovative future research, however, would be to implement participatory design into practice,

using the provided guidelines and evaluate the effects of participatory design on students' and teachers' perceptions of the learning environment.

To conclude, both background literature and the results of the current study favour the implementation of participatory design in secondary education. Areas in which participatory design is already practiced, notice large benefits of this as it leads to more effective design. The current study underlines the existence of a gap between students and teachers. The results support that participatory design could be a tool for bridging this gap, while considered as a desirable and feasible initiative by both teachers and students. Concrete suggestions for practising participatory design emerged from this study, based on students' and teachers' own preferences.

Appendix

Coding Scheme: Description of Response Categories to Interview Questions

Question	Label	Description
1	*Why do you think that in general, students perceive education less positive than teachers?*	
	Workload	Students have to work hard; difficult work; little time; difficulties with planning; according to students, teachers experience less pressure than they do.
	Obligation	School is obligatory for students; students do not have much freedom of choice, whereas teachers do.
	No pleasure	Students simply do not like going to school; school is boring; students prefer doing other things.
	Other explanations	An explanation other than listed above is given.
2	*Does the student convey educational ideas to teachers?*	
	Yes	Students do convey their ideas to teachers.
	No, negative expectations	Students assume that conveying their ideas to teachers is of no use; according to students, teachers do not use students' opinions.
	No, assertiveness	Students do not dare to convey their ideas to teachers; students are afraid of conflicts with teachers.
	No, no opportunity	Teachers do not ask students about their opinions; teachers do not give students the opportunity to convey their ideas.
	No, never thought about it	Students have never considered the possibility of conveying their ideas to teachers.
	No, other or no explanation	The answer is no, but another explanation than listed above is given, or no explanation is given at all.
3	*In your school, do students and teachers collaborate about educational design?*	
	No	No form of discussion between students and teachers exists.
	Yes, though not effectively	A discussion format exists, but in an ineffective way; no feedback emerges; nobody actually knows what is discussed; discussions do not include educational topics.
	Do not know	The participant is not sure whether any form of discussion group exists or not.

	Yes, resonance group	A group consisting of students and teachers deliberates about educational topics; a few students per class discuss problems and opinions with a group of teachers of several disciplines.
	Yes, student council	A group of students deliberates about school topics with a guiding teacher.
	Yes, in the classroom	Discussions between students and teachers take place in the classroom.
	Yes, coordinator	Discussions take place between students and the class coordinator.
4	*How would you feel about engaging in participatory design of education yourself?*	
	Positive	Clearly positive attitude towards cooperating with students / teachers.
	Negative	Clearly negative attitude towards cooperating with students / teachers.
	Sometimes yes, no	It depends: some topics are negotiable, whereas others are not.
	Do not know / sceptic / neutral	The participant is not sure about their opinion towards cooperating with students / teachers, or has a neutral opinion on this.
	No clear answer	The participant does not provide a clear answer to the question.
5	*How do you think other students / teachers would feel about engaging in participatory design?*	
	Majority is willing	Most students / teachers will have a positive attitude towards cooperating with teachers / students.
	Some will, some will not	It varies among individuals; the distribution between proponents and opponents will be more or less equal.
	Majority is not willing	Most students / teachers will have a negative attitude towards cooperating with teachers / students.
6	*How do you think teachers / students would feel about engaging in participatory design?*	
	Majority is willing	Most students / teachers will have a positive attitude towards cooperating with teachers / students.
	Some will, some will not	It varies among individuals; the distribution between proponents and opponents will be more or less equal.
	Majority is not willing	Most students / teachers will have a negative attitude towards cooperating with teachers / students.
	Do not know / no clear answer	The participant does not know how most students / teachers will feel about cooperation; the participant does not provide a clear answer.

7	*Which educational topics would you like to discuss when it comes to participatory design?*	
	Pedagogies	Teacher behaviour in class related to teaching; lesson structure; work groups or individual work.
	Lesson content	(Contents of) subject matter.
	Planning	Planning of deadlines for assignments; scheduling of subject matter.
	Everything	Everything students want to discuss is negotiable.
	Instructional material	E. g., books used for lessons.
	Amount	Amount of subject matter, homework, workload.
	Other	Another answer than listed above is given.
8	*When it comes to participatory design, which organisational format would you prefer?*	
	Classical	Discussions take place in the classroom, with the entire class.
	Group of students	A small group of students discusses with a teacher.
	A single student	Students discuss individually with teachers; a class representative conveys class' opinions to teachers.
	Meetings	Discussions occur in organised, structured meetings.
	After lessons	Discussions take place after classes.
9	*How often would you like the participation to take place?*	
	Once to twice a month	Discussions take place one to two times a month.
	Once to thrice a year	Discussions take place one to three times a year.
	Situational	Discussions take place occasionally, if the need for this arises due to problems or situations.
	Every week	Discussions take place every week or more often.
	Do not know	The participant does not know how often discussions should take place; has no preference towards this; provides more than one, possibly inconsistent answer.
10	*If you participated, with which kind of teacher / students would you prefer to cooperate?*	
	Open attitude	Display an open attitude towards other opinions; listening to what other has to say.
	Involved	Knowing personal things about people; being active and arranging many things; wants what is best for other.
	Other	Another answer than listed above is given.
	No preference	The participants do not have preferences concerning types of people she/he would want to cooperate with.
	Motivated	Someone who is motivated and driven in schoolwork.

11a	*Research showed that especially students, who are less motivated for learning, perceive the learning environment more negative. Do you think it is valuable and feasible to brainstorm/cooperate with these students about improvement of the learning environment?*	
	Less motivated: yes	Cooperating with less motivated students is possible.
	Less motivated: do not know	The participant is not sure, has a sceptic attitude towards cooperating with less motivated students.
	Less motivated: no	Cooperating with less motivated students is impossible.
11b	*For which courses would you prefer to cooperate with teachers?*	
	Difficult courses	Courses in which student encounters difficulties.
	No preference	The participant does not have preferences concerning courses he / she would want to practice participatory design for.
	Important courses	Courses which are important for students because they prepare for their final examination.
	Poorly taught courses	Courses which are educated ineffectively.
	Other	Another answer than listed above is given.
12	*Do you think it would be possible to practice participatory design for mathematics / Dutch language education?*	
	Yes	Student thinks it possible to practice participatory design for current Dutch / mathematics education.
	No	Student thinks it impossible to practice participatory design for current Dutch / mathematics education.

References

Bartholomew, L. K., Parcel, G. S., Kok, G., & Gottlieb, N. H. (2001). *Intervention mapping: Designing theory and evidence-based health promotion programs.* Mountain View, CA: Mayfield.

Cook-Sather, A. (2002). Authorizing students' perspectives: Toward trust, dialogue, and change in education. *Educational Researcher, 31,* 3-14.

Cook-Sather, A. (2001). Unrolling roles in techno-pedagogy: Toward new forms of collaboration in traditional college settings. *Innovative Higher Education, 26,* 121-139.

Cunningham, W. G. (1975). The impact of student-teacher pairings on student orientation toward school related tasks. *Journal of Educational Research, 68*, 378-381.

Doppelt, Y. (2004). Impact of science-technology learning environment characteristics on learning outcomes: Pupils' perceptions and gender differences. *Learning Environments Research, 7*, 271-293.

Elen, J., Lowyck, J., & Bamps, H. (1998). The relation between student's perceptions of problem-based learning and learning style components. In J. J. G. van Merriënboer & G. Moerkerke (Eds.), *Instructional design for problem-based learning: Proceedings of the third workshop of the EARLI SIG instructional design.* Maastricht, The Netherlands: University of Maastricht.

Elen, J., & Lowyck, J. (1999). Metacognitive instructional knowledge: Cognitive mediation and instructional design. *Journal of Structured Learning and Intelligent Systems, 13,* 145-169.

Entwistle, N. J. (1991). Approaches to learning and perceptions of the learning Environment. *Higher Education, 22,* 201-204.

Festinger, L. (1957). *A theory of cognitive dissonance*. Stanford, CA: Stanford University Press.

Jenlink, P., & Carr, A. A. (1996). Conversation as a medium for change in education. *Educational Technology, 1,* 31-38.

Kensing, F., & Blomberg, J. (1998). Participatory design: Issues and concerns. *Computer Supported Cooperative Work, 7*, 167-185.

Kensing, F., Simonsen, J., & Bødker, K. (1998). MUST: A method for participatory design. *Human-Computer Interaction, 13*, 167-198.

Könings, K. D., Brand-Gruwel, S., & van Merriënboer, J. J. G. (2005a). Towards more powerful learning environments through combining the perspectives of designers, teachers and students. *British Journal of Educational Psychology, 75,* 645-660.

Könings, K. D., Brand-Gruwel, S., & van Merriënboer, J. J. G. (2005b, June). *Combining different perspectives on a learning environment: Students' and teachers' perceptions.* Poster presented at the conference Advancing Teacher Learning, Ascona, Switzerland.

Könings, K. D., Brand-Gruwel, S., & van Meriënboer, J. J. G (2005c, August). *Students' perspective on an innovative learning environment and the relation with learning-related student characteristics*. Paper presented at the 11th European Conference for Research on Learning and Instruction (EARLI), Nicosia, Cyprus.

Könings, K. D., Brand-Gruwel, S. & Van Merriënboer, J. J. G. (2005d). *The relation between students' perspective and learning-related student characteristics: Perceptions of the whole learning environment versus a specific course.* Manuscript in preparation.

Könings, K. D., Brand-Gruwel, S. & van Merriënboer, J. J. G. (in press). Teachers' perspective on innovations: Implications for educational design. *Teaching and Teacher Education.*

Lincoln, Y. S. (1995). In search of students' voices. *Theory into Practice, 34,* 88-93.

Mankin, D., Cohen, S. G., & Bikson, T. K. (1997). Teams and technology: Tensions in participatory design. *Organizational Dynamics, 26*, 63-74.

Markopoulos, P., & Bekker, M. (2003). Interaction design and children. *Interacting with Computers, 15*, 141-149.

Meister, D., & Enderwick, T. P. (2002). *Human factors in system design, development, and testing.* Mahwah, NJ: Lawrence Erlbaum Associates.

Mumford, E. (1997). The reality of participative systems design: Contributing to stability in a rocking boat. *Information Systems Journal, 7*, 309-322.

Packer, J., & Bain, J. D. (1978). Cognitive style and teacher-student compatibility. *Journal of Educational Psychology, 70*, 864-871.

Pambookian, H. S. (1976). Discrepancy between instructor and student evaluations of instruction: Effect on instructor. *Instructional Science, 5*, 63-75.

Paulussen, T., Kok, G., Schaalma, H., & Parcel, G. S., (1995). Diffusion of AIDS curricula among Dutch secondary school teachers. *Health Education Quarterly, 22,* 227-243.

Roche, L. A., & Marsh, H. W. (2000). Multiple dimensions of university teacher self-concept: Construct validation and the influence of students' evaluations of teaching. *Instructional Science, 28,* 439-468.

Saracho, O. N. (2003). Matching teachers' and students' cognitive styles. *Early Child Development and Care, 173*, 161-173.

Schweitz, R., & Granata, E. (1997). Could participative design be the answer to us? *Journal of Quality & Participation, 20*, 34-43.

Trout, J. S., & Crawley, F. E. (1985). The effects of matching instructional strategy with selected student characteristics on ninth grade physical science students' attitudes and achievement. *Journal of Research in Science Teaching, 22*, 407-419.

Winne, P. H., & Marx, R. W. (1982). Students' and teachers' views of thinking processes for classroom learning. *The Elementary School Journal, 82*, 493-518.

Table 1

Interview Questions and Interrater Reliability of the Coding System per Question

	Interview question	*Kappa*
1	Why do you think that in general, students perceive education less positive than teachers?	.89
2	Does the student convey educational ideas to teachers?	.90
3	In your school, do students and teachers collaborate about educational design?	.89
4	How would you feel about engaging in participatory design of education yourself?	1.00
5	How do you think other students / teachers would feel about engaging in participatory design?	1.00
6	How do you think teachers / students would feel about engaging in participatory design?	.73
7	Which educational topics would you like to discuss when it comes to participatory design?	.77
8	When it comes to participatory design, which organisational format would you prefer?	.89
9	How often would you like the participation to take place?	1.00
10	If you participated, with which kind of teacher / students would you prefer to cooperate?	.83
11a	Research showed that especially students, who are less motivated for learning, perceive the learning environment more negative. Do you think it is valuable and feasible to brainstorm/cooperate with these students about improvement of the learning environment?	.84
11b	For which courses would you prefer to cooperate with teachers?	1.00
12	Do you think it would be possible to practice participatory design for mathematics / Dutch language education?	1.00

Note. Question 11a is only used in teacher interviews. Question 11b and 12 are only used in student interviews.

Table 2

Response Percentages to Interview Questions by Students and Teachers

Question	Response	Students	Teachers	χ^2
1	*Why do you think that in general, students perceive education less positive than teachers?*			
	Workload	58.3	25.0	3.57*
	Obligation	25.0	16.7	.32
	No pleasure	16.7	0.0	2.25
	Other	16.7	66.7	9.00**
2	*Does the student convey educational ideas to teachers?*			
	Yes	0.0	50.0	14.40**
	No, negative expectations	29.2	0.0	4.35*
	No, assertiveness	16.7	0.0	2.25
	No, no opportunity	16.7	8.3	.47
	No, never thought about it	12.5	0.0	1.64
	No, other or no explanation	29.2	41.7	.56
3	*In your school, do students and teachers collaborate about educational design?*			
	No	41.7	16.7	2.25
	Yes, though not effectively	16.7	25.0	.36
	Do not know	16.7	33.3	1.29
	Yes, resonance group	12.5	33.3	2.22
	Yes, student council	8.3	0.0	1.06
	Yes, in the classroom	8.3	16.7	.56
	Yes, coordinator	4.2	0.0	.51
4	*How would you feel about engaging in participatory design of education yourself?*			
	Positive	58.3	50.0	.23
	Negative	20.8	8.3	.90
	Sometimes yes, no	0.0	25.0	6.55**
	Do not know / sceptic / neutral	16.7	8.3	.47
	No clear answer	4.2	8.3	.27
5	*How do you think other students / teachers would feel about engaging in participatory design?*			
	Majority is willing	41.7	25.0	.96
	Some will, some will not	45.8	33.3	.51
	Majority is not willing	12.5	33.3	2.22
6	*How do you think teachers / students would feel about engaging in participatory design?*			
	Majority is willing	50.0	16.7	3.74*
	Some will, some will not	20.8	33.3	.67
	Majority is not willing	16.7	25.0	.36
	Do not know/ no clear answer	12.5	33.3	2.22

7	*Which educational topics would you like to discuss when it comes to participatory design?*			
	Pedagogies	62.5	66.7	.06
	Lesson content	25.0	8.3	1.42
	Planning	20.8	8.3	.90
	Everything	4.2	25.0	3.52*
	Instructional material	12.5	0.0	1.64
	Amount	12.5	0.0	1.64
	Other	20.8	16.7	.09
8	*When it comes to participatory design, which organisational format would you prefer?*			
	Classical	58.3	41.7	.89
	Group of students	16.7	75.0	11.80**
	A single student	33.3	16.7	1.11
	Meetings	8.3	0.0	1.06
	After lessons	8.3	8.3	.00
9	*How often would you like the participation to take place?*			
	Once to twice a month	54.2	16.7	4.63**
	Once to thrice a year	16.7	41.7	2.67
	Situational	16.7	25.0	.36
	Every week	12.5	16.7	.12
	Do not know	0.0	8.3	2.06
10	*If you participated, with which kind of teacher / students would you prefer to cooperate?*			
	Open attitude	62.5	0.0	12.86**
	Involved	20.8	0.0	2.90
	Other	29.2	0.0	4.35*
	No preference	4.2	41.7	8.10**
	Motivated	0.0	25.0	6.55**
11a	*Research showed that especially students, who are less motivated for learning, perceive the learning environment more negative. Do you think it is valuable and feasible to brainstorm/cooperate with these students about improvement of the learning environment?*			
	Less motivated: yes	-	41.7	-
	Less motivated: do not know	-	50.0	-
	Less motivated: no	-	8.3	-
11b	*For which courses would you prefer to cooperate with teachers?*			
	Difficult courses	33.3	-	-
	No preference	33.3	-	-
	Important courses	12.5	-	-
	Poorly taught courses	12.5	-	-
	Other	8.3	-	-

12	*Do you think it would be possible to practice participatory design for mathematics / Dutch language education?*			
	Yes	79.2	-	-
	No	12.5	-	-

$^{*}p < .10$. $^{**}p < .05$.